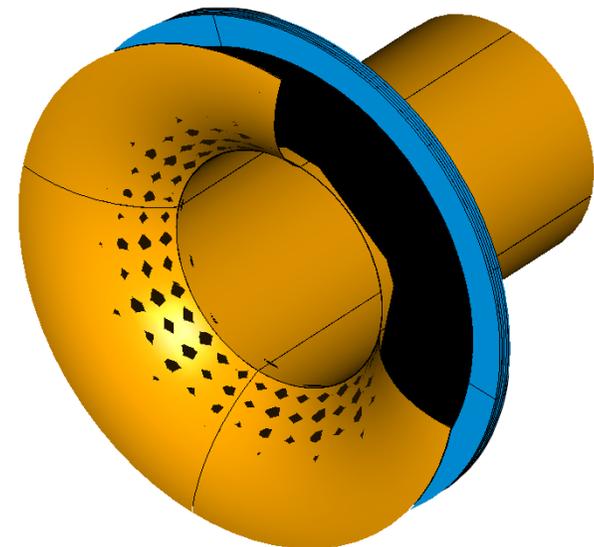


Mu2e-II Tracker Workgroup Report

Dan Ambrose
University of Minnesota
Oct 28th, 2020



Overview:

Simulations

Straw Material Studies

Simulations

Working on adapting the FastSim model for Mu2e-II

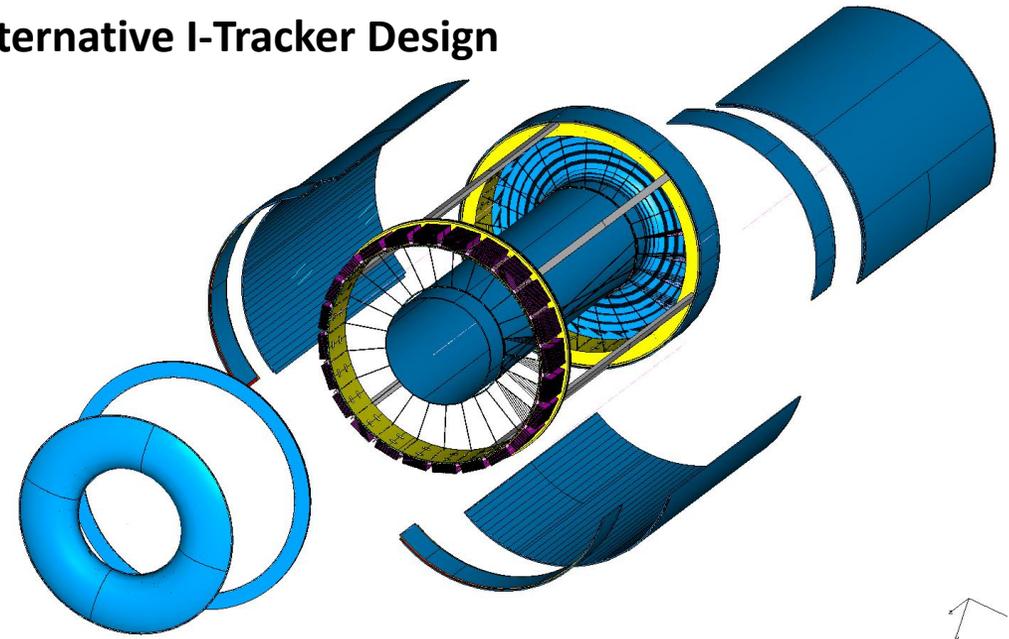
In FastSim, the particle material integrations are modeled with simplified cross-sections and formulas.

xml files will allow quick modification of detector geometry and material.

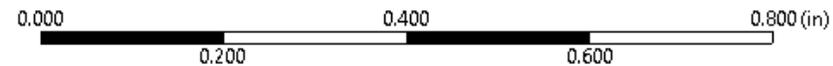
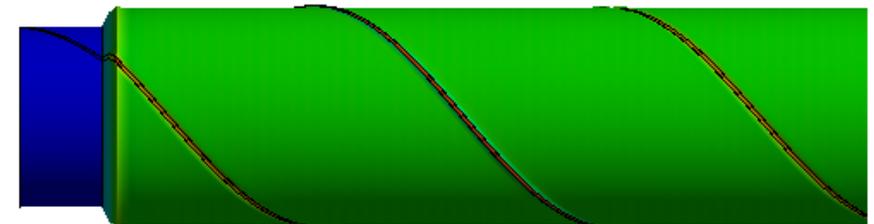
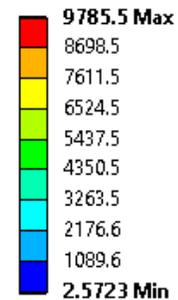
This can be used to estimate momentum resolution for different designs and geometries.

Additional work is being done simulating straws and material components.

Mu2e Alternative I-Tracker Design



Mylar Stress
Type: Equivalent (von-Mises) Stress
Unit: psi
Time: 5
8/17/2020 12:04 PM



Y
Z
Erik Voirin

Considering Radiation Levels

We have been looking into the effects of the increased radiation and occupancy on the tracker.

This will need to be estimated in simulation first.

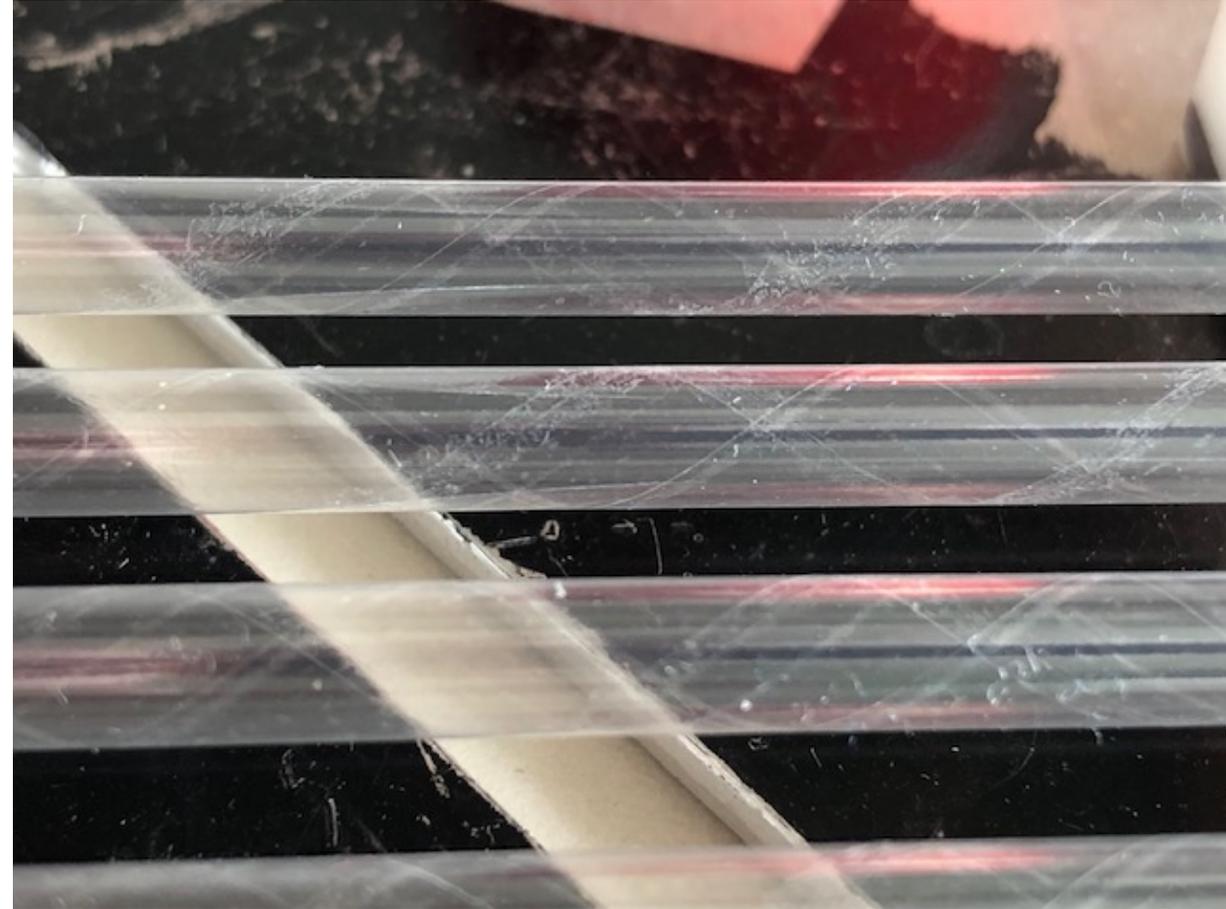
Unlikely Mu2e FPGA would pass with $\sim x40$ increase with safety factors.

ASICs could be an answer, but this will take time to build and design.

We don't have anyone working on this currently.

Update LDRD Research : Straw Tests

- **First test batch of 8 μm straws**
 - Made from unmetalized Mylar
 - Holds 30 PSI gauge pressure
 - Testing mechanical properties
- **Second test batch**
 - Metalized Mylar to be used
 - Difficulty finding someone to metalize mylar this thin
- **Other straw production options :**
 - Single linear seam straws (Comet, NA62)
 - Extruded Aluminum straw

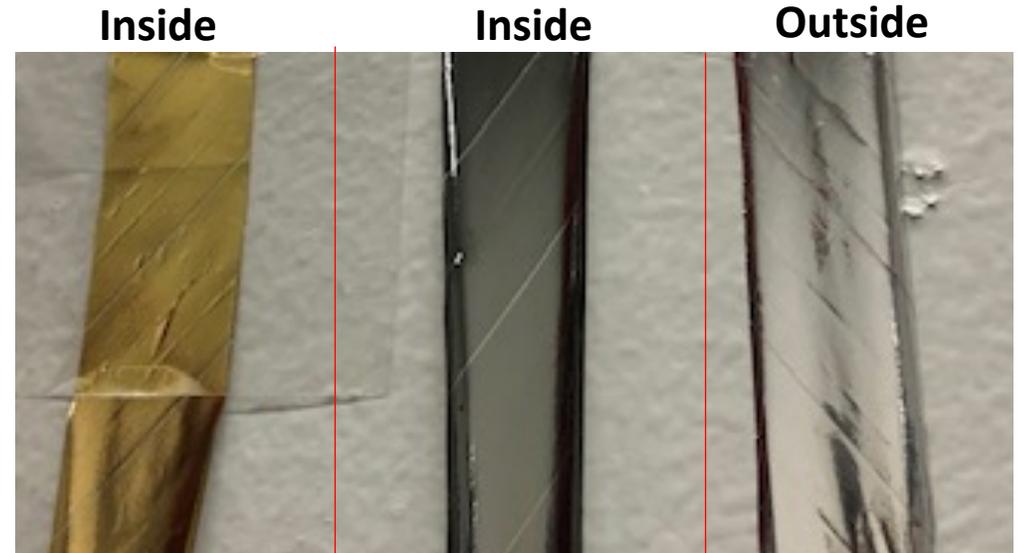


Pressurized 8 μm Mylar Straws

Straw Mentalization

- **Benefits of dropping Gold:**
 - Less high Z material (~8% Radiation length)
 - More consistent product
 - Significantly Cheaper (~5x cheaper)
 - More vendors available
- **Recent trackers have had success with bare Aluminum**
 - Belle-2 used field wires of bare aluminum
- **We have AL-only Mu2e straws which are 4 years old**
 - In planning phase of designing tests to determine any problems with age.

Mu2e Straws



Gold on Aluminum
No mixing
Resistance = R

Gold/Aluminum
Intermetallic
Resistance = 4R

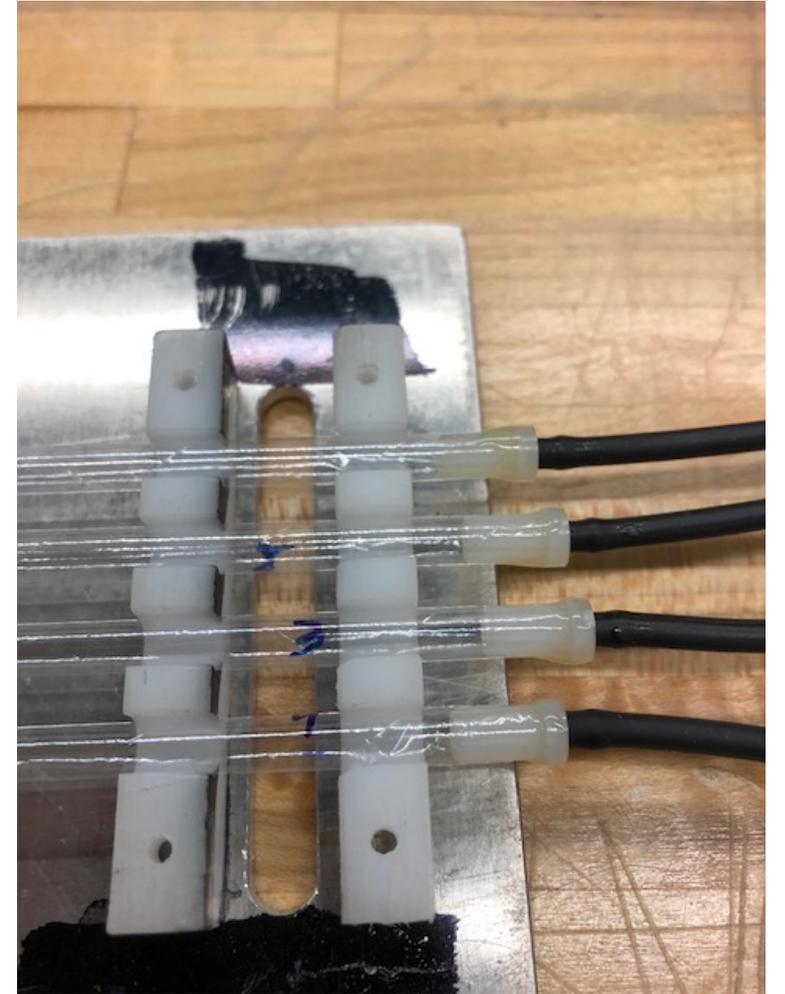
Aluminum
No gold
Resistance = 2R

Investigating Prototype Construction

Looking at making a 4 or 8 straw prototype.

Test Construction Techniques:

- Tensioning inflated straws
- Epoxying inflated straws
- Cut straws to length in Inner Ring
- Investigate self-aligning termination



Sealed straws with endpieces which can handled for tensioning

Mu2e-II Tracker Workgroup:

Join the list-serve : MU2EII-TRACKER@fnal.gov

Meeting Schedule : Bi-weekly Tuesdays 11:00 AM CST. Next one is Nov 10th.
Zoom link sent through list-serv

Workshop : Looking to hold the first workshop the first week of December.
Exact date and time TBD

We would gladly welcome more interested people.

Please contact Gianfranco(giovanni.tassielli@le.infn.it), me(ambr0028@umn.edu), or come to the workgroup meeting though the list-serve

Summary

- **Working on simulations and material tests with prototypes**
- **Many good ideas, but limited hands has things moving slowly**
 - **Let us know if you are interested in helping**
- **Planning a workshop first week in December**